

# Quick X-ray Absorption and Scattering (QAS)

## QAS at NSLS-II

- Will enable in-situ and operando studies of complex nanoscale systems undergoing real-time transformations
- Will enable synchronous measurements of nanocatalysts by complementary techniques including IR, XAS, XRD, DAFS and mass spectrometry
- Will probe complex interactions in nanoscale systems at the time scale from tens of ms to hours and length scale from Å to  $\mu\text{m}$

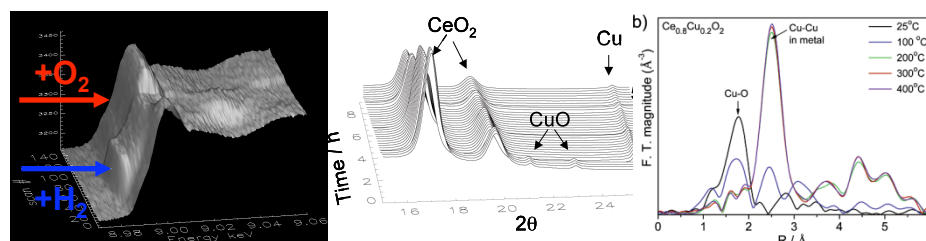
## Examples of Science Areas & Impact

- CATALYSIS: Investigations of structure, kinetics, dynamics and reactivity during in situ transformations with 10 ms time resolution
- GLASSES AND MEMORY ALLOYS: Understanding correlations between glass-forming ability and structure of novel glasses and phase-change materials
- ENVIRONMENTAL SCIENCE: Kinetics of rapid chemical processes on mineral surfaces and soils
- ENERGY GENERATION AND STORAGE: Understanding physical and chemical processes in batteries and fuel cells



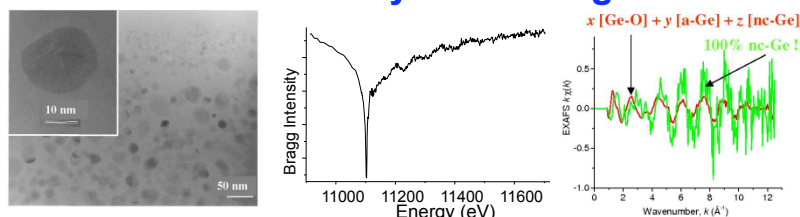
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## Water-Gas Shift catalyst: $\text{Cu}_{0.2}\text{Ce}_{0.8}\text{O}_2$



These data were obtained at separate beamlines: *J. Phys. Chem. B* 2006, 110, 428 (2006). One needs the combination of fast XAFS and fast XRD to obtain composition, oxidation state and structure of the system simultaneously, which will be available at QAS beamline.

## New method for catalysis investigation: DAFS



Diffraction anomalous fine structure has been used before to deconvolute the nanocrystalline and amorphous phases of the same element: *Phys. Rev. Lett.* 89, 285503 (2002). At QAS beamline, it will be used to investigate heterogeneous mixtures of reduced and oxidized phases, as well as the nucleation and growth of nanophases.

## Beamline Capabilities

**TECHNIQUES:** x-ray absorption spectroscopy and x-ray diffraction with 10 ms time resolution

**MONOCHROMATORS:** double crystal (slow scanning) and channel cut (Quick EXAFS)

**SOURCE:** three-pole wiggler

